

when, however, the values are very low positive. October 14th shows the greatest variation for any one date, and in less marked degree, October 24th.

At Columbus, Ohio, large negative values were obtained on October 4th, during the passage of heavy cumulo-stratus clouds, moving slowly from the southwest, with a slight rain during the night. On October 27th, during light rain, the values were nearly zero. Rain during the night of the 26th was preceded by very low values during the day. The highest positive values were obtained on the 8th and 11th.

At Ithaca, New York, negative values were recorded on October 5th, at 9 a. m., during dense haze. On October 14th, during threatening weather, with high southerly winds, throughout the entire day. On October 17th, at 1 and 3 p. m., following light snow, during which the indications were positive, high negative values were obtained. On October 26th, during threatening weather, and on October 27th, during fog, negative values were obtained. No rain is recorded during the beginning of the month until October 12th, and, with the exception of October 5th, when haze is noted, there were no negative indications for this part of the month. A light rain occurred on the 12th, and a light shower on October 15th, with positive values. Fog and rain on the night of the 27th and morning of the 28th, although preceded by negative and low positive values, were accompanied by high positive values. The highest values obtained were on October 23d, at the last three observations, during clear weather, with fresh, westerly winds; on October 28th, in the morning, during fog and light rain, and on October 12th, in the afternoon, during haze, with light westerly winds.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories, as follows:

- Arizona*.—Fort Apache, 19th.
- Arkansas*.—Little Rock, 21st.
- California*.—San Francisco, 15th, 18th, 19th, 24th, 25th, 28th; Sacramento, 24th.
- Connecticut*.—North Colebrook, 4th.
- Florida*.—Archer, 1st, 2d, 9th; Jacksonville, 8th.
- Georgia*.—Savannah, 3d.
- Idaho*.—Boisé City, 9th, 26th.
- Illinois*.—Riley, 3d, 6th, 11th, 12th, 20th, 22d; Springfield, 3d, 9th.
- Indiana*.—Butlerville, 14th.
- Indian Territory*.—Fort Reno, 25th.
- Iowa*.—Keokuk, 22d.
- Kansas*.—Independence and Westmoreland, 3d; Globe, 3d, 11th, 21st; West Leavenworth, 3d, 21st.
- Kentucky*.—Frankfort, 25th.
- Massachusetts*.—Blue Hill Observatory, 17th.
- Michigan*.—Marquette, 2d, 7th.
- Minnesota*.—Moorhead, 2d.
- Missouri*.—Centreville, 3d.
- Montana*.—Fort Custer, 4th, 29th.
- Nebraska*.—Brownville, 21st.
- Nevada*.—Carson City, 23d, 28th.
- New Jersey*.—Clayton, 4th, 6th, 17th.
- New York*.—Oswego, 4th.
- North Carolina*.—New River Inlet, 8th, 10th, 11th, 13th, 17th, 20th, 26th; Fort Macon, 10th.
- Ohio*.—Wauseon, 3d, 12th; Tiffin, 17th.
- Oregon*.—Roseburg, 26th.
- Pennsylvania*.—Wellsborough, 3d, 26th; Dyberry, 4th.
- South Carolina*.—Stateburg, 3d, 10th, 17th, 21st.
- Tennessee*.—Chattanooga, 4th; Nashville, 4th, 9th, 10th, 25th.
- Utah*.—Frisco, 20th, 28th.
- Virginia*.—Variety Mills, 1st, 4th; Lynchburg, 4th; Cape Henry, 10th, 26th; Dale Enterprise, 10th, 17th, 31st.
- Wisconsin*.—Delavan, 11th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories, as follows:

- Alabama*.—Mobile, 6th, 12th.
 - Arizona*.—Fort Apache, 2d, 28th; Yuma, 8th; Prescott, 9th; Fort Thomas, 10th.
 - California*.—San Diego, 10th; Red Bluff, 14th.
 - Colorado*.—Las Animas, 6th.
 - Connecticut*.—New Haven, 4th; New London, 4th, 8th.
 - Dakota*.—Bismarck, 7th.
 - Florida*.—Cedar Keys, 4th, 5th, 6th; Limona, 6th; Sanford, 7th; Key West, 7th, 10th, 11th, 12th; Jacksonville, 8th; Archer, 8th, 9th; Pensacola, 9th; Manatee, 10th, 11th, 15th.
 - Georgia*.—Savannah and Augusta, 9th.
 - Illinois*.—Springfield, Cairo, and Pekin, 3d; Riley, 11th, 13th, 17th; Windsor, 3d, 12th.
 - Indiana*.—Jeffersonville and Terre Haute, 3d; Fort Wayne, 11th; Butlerville and Lafayette, 13th.
 - Iowa*.—Dubuque, Cedar Rapids, and Urbana, 11th; Clinton, 12th, 17th; Manchester, 16th.
 - Kansas*.—El Dorado, Independence, and Westmoreland, 3d; Wyandotte, 3d, 7th, 8th, 9th, 14th; Leavenworth, 8th; Salina, 31st.
 - Kentucky*.—Frankfort, 3d, 7th.
 - Maine*.—Gardiner, 4th; Cornish, 4th, 11th, 12th, 18th.
 - Massachusetts*.—Somerset, 4th, 6th; Cottage City, 5th.
 - Michigan*.—Port Huron, 8th, 11th; Grand Haven, 9th, 11th; Detroit, Lansing, and Thornville, 11th.
 - Montana*.—Fort Custer, 14th.
 - Nebraska*.—North Platte, 4th, 7th; Omaha, 17th; Hay Springs, 18th.
 - New Jersey*.—Atlantic City, Clayton, Dover, and Readington, 4th; Egg Harbor City, 4th, 10th; Beverly, 4th, 6th, 15th; Upper Montclair, 5th.
 - New Mexico*.—Fort Stanton, 2d, 15th.
 - New York*.—Setauket, 4th; Rochester and Oswego, 8th; Factoryville, 9th.
 - North Carolina*.—Weldon, 4th; New River Inlet, 4th, 7th, 9th; Wilmington, 6th; Fort Macon and Smithville, 9th, 10th; Kitty Hawk and Hatteras, 10th; Charlotte, 10th, 16th.
 - Ohio*.—Tiffin, 3d; Napoleon, 10th, 11th, 13th; Wauseon, 11th.
 - Oregon*.—Linkville, 10th; Roseburg, 31st.
 - Pennsylvania*.—Wellsborough, 17th.
 - Rhode Island*.—Block Island, 4th.
 - South Carolina*.—Spartanburg, 1st, 10th, 20th, 21st; Charleston, 9th; Stateburg, 9th, 10th.
 - Tennessee*.—Nashville, 10th.
 - Texas*.—Palestine, 3d; Galveston, 11th; Fort Elliott, 15th.
 - Utah*.—Salt Lake City, 12th.
 - Virginia*.—Cape Henry, 4th, 10th; Bird's Nest, 4th, 5th, 10th, 14th; Rappahannock, 7th, 12th, 16th; Lynchburg, 10th; Dale Enterprise, 10th, 14th, 21st.
 - Washington Territory*.—Tatoosh Island, 9th.
 - Wisconsin*.—Green Bay, 8th; Beloit, 9th to 12th, 14th, 16th; Milwaukee, 12th.
 - Wyoming*.—Fort Bridger, 3d, 15th, 25th to 28th.
- The phases of the moon (Washington mean time) during October, as given in "The American Ephemeris and Nautical Almanac" for 1886, are as follows: New moon, 26th, 14 h. 7.2 m.; first quarter, 4th, 5 h. 25.2 m.; full moon, 12th, 10 h. 15.7 m.; last quarter, 19th, 21 h. 32.6 m.; apogee, 8th, 8.3 h.; perigee, 24th, 6.7 h.

MIRAGE.

Saint Vincent, Minnesota: at 8.10 a. m. of the 29th a well-defined mirage was seen to the south; the image of a range of hills known as the "Ridge," distant twenty-five miles, was lifted into view. The phenomenon was visible until 8.30 a. m. Mirages were also observed on the following dates:

- Webster, Dakota, 21st.
- Salina, Kansas, 7th, 8th, 11th, 27th, 29th.

Marquette, Nebraska, 26th.
Reidsville, North Carolina, 30th.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Harrisburg, Pennsylvania, 21st: throughout the Lebanon Valley very little rain has fallen for several weeks, and many wells and cisterns have become dry. The drought extends over the central portions of the state; farmers in Berks and neighboring counties report the drought to be the severest that has occurred within twenty years. In the Mahanoy Valley one heavy rain only has fallen in nine weeks.

Chattanooga, Tennessee, 23d: dry weather has prevailed in this vicinity during the past six weeks. Farmers state that owing to the dryness of the soil they are unable to plow and that it is impossible to prepare land properly for fall seeding.

Nashville, Tennessee, 25th: a severe drought prevails throughout the central part of the state; streams, wells, and springs have become dry. Only 0.45 inch of rain has fallen since the 28th of September.

Portland, Maine, 25th: a severe drought prevails in this vicinity and throughout the entire state. Many wells are dry and much inconvenience and loss has occurred from the lack of rain.

Kitty Hawk, North Carolina, 26th: a drought has prevailed in this vicinity during the past two months; creeks and springs have become dry and cattle are suffering from want of sufficient water.

Upper Montclair, Essex county, New Jersey: on the 26th heavy rain set in and the long drought was broken. Wells and cisterns had become exhausted and small streams were dry.

Reidsville, Rockingham county, North Carolina: during the past two months the sowing of wheat and rye has been retarded by dry weather. The drought was broken on the 26th by a copious rainfall.

Quakertown, Bucks county, Pennsylvania: on the 26th and 27th 1.60 inches of rain fell, breaking the drought which had become quite severe; many wells and creeks were dry and, on account of the hardness of the soil, farmers have been unable to prepare land for fall seeding.

Chincoteague, Virginia: copious rain fell on the 27th. The continued dry weather had seriously affected the oyster and agricultural interests.

Moorestown, Burlington county, New Jersey, 31st: owing to the prevailing drought wheat and rye sown on the first days of the month have not yet germinated.

Wytheville, Wythe county Virginia: the total rainfall for the months of September and October is only 1.35 inches, while the normal for this station is 6.37 inches. The ground has become thoroughly dried and grain, pasturage, and late vegetables have suffered; streams and wells are very low.

Rappahannock Station, Fauquier county, Virginia: owing to the drought throughout this section much of the land sown in wheat during the first days of the month will have to be resown.

Milan, Gibson county, Tennessee, 31st: during the past six weeks a severe drought has prevailed in this locality, springs and wells are failing and it is necessary, in some parts of the county, to drive stock two and three miles for water.

Milledgeville, Baldwin county, Georgia, 31st: the total rainfall of the past two months is only 0.59 inch, and since August 2d only 2.64 inches of rain have fallen in this locality. Owing to the dry weather fall crops are short, and farmers have been unable to sow small grain.

Livingston, Sumter county, Alabama: the month has been extremely dry; total rainfall, 0.76 inch; owing to the dry weather the season has been very favorable for cotton picking.

The following note in regard to the drought in Alabama is from the October report of the "Alabama Weather Service":

The drought that began the 23d of August has extended through October and continues unabated. This period already is longer by one week than the corresponding drought that occurred in 1884. This season has resulted in

good as well as evil to the farming interests throughout the country, because the cotton plant had about completed its growth before the soil became too dry, and the bolls opened rapidly under the warming influence of the sun's rays; the farmer has consequently been enabled to gather the staple in an unstained condition. The drought has, however, been unfavorable to the preparation of market gardens and planting of fall crops.

FOREST AND PRAIRIE FIRES.

Bismarck, Dakota: on the 3d a prairie fire originated on the line between Hughes and Sully counties and passed over the prairie at the rate of fifteen miles per hour before a strong southerly gale that was prevailing at the time. Ploughed fire guards, from ten to thirty feet wide, did not obstruct the progress of this fire, as ignited "tumble weeds" were blown across and speedily communicated the fire to the grass on the opposite side.

Moorhead, Clay county, Minnesota: on the 6th and 7th prairie fires were burning in this county, destroying much property in the form of hay, wheat stacks, and fencing. Owing to the continued drought and high winds, fires are more frequent and extensive than usual; on the 9th a large area of prairie northeast of Moorhead was burned over and much damage was done in the vicinity of the villages of Hope and Leonard, 35,000 bushels of wheat, considerable farming machinery, and many tons of hay were destroyed.

Sherman, Grayson county, Texas: between the 10th and 15th a large area of prairie in the northeastern corner of the Indian Territory, extending along each side of the Missouri, Kansas, and Texas Railroad, was burned over. A number of cattle were burned, and also large quantities of hay.

Saint Paul, Minnesota: from the 10th to the 18th prairie fires were burning in the Turtle Mountain region, Bottineau county, Dakota, destroying the grass and timber on two hundred square miles of land. Thousands of tons of hay were also destroyed, with a large number of houses, barns, and all kinds of stock, many settlers losing all their possessions. It is reported that the losses will reach \$700,000.

Egg Harbor City, Burlington county, New Jersey: the long drought has dried the springs and smaller water courses and made the pine forests very combustible. On the 17th the forest in the southern part of the county was ignited by a spark from a locomotive, the fire spread rapidly over several miles of territory and burned much valuable timber.

Akron, Summit county, Ohio: on the 19th and 20th the "Copley swamps," a large body of marshy land covering several square miles, were burned over, together with several hundred acres of timber and pasture land and many miles of fencing. The soil in the neighborhood of these swamps is composed of muck which burned for several days, in some places to a depth of three feet into the ground.

North Platte, Nebraska: on the 23d an extensive prairie fire occurred in the neighborhood of this station, burning over an area ten miles long by two wide. The fire was accompanied by a high northwesterly wind, maximum velocity twenty-four miles per hour, which caused the fire to spread with great rapidity. Besides burning twenty square miles of valuable prairie grass, 1,500 tons of baled hay were consumed, with many miles of fencing; estimated loss \$10,000.

Reading, Pennsylvania: on the 23d, 24th, and 25th extensive forest fires prevailed in the Blue Mountains near this town, burning over 5,000 acres of valuable timber land. The charred remains of a number of cattle were found in the burned district.

Dover, Strafford county, New Hampshire: on the 23d and 24th forest fires burned 1,200 acres of valuable timber land in this vicinity.

Forest and prairie fires have also been reported from the following places:

Linkville, Oregon: forest fire, 27th.

Saint Vincent, Minnesota: prairie fires, 2d, 4th to 9th, 28th.

Moorhead, Minnesota: prairie fires, 11th, 14th, 19th, 23d, 31st.

Yankton, Dakota: prairie fires, 29th, 31st.